

SHIAWASSEE COUNTY DETENTION POND DESIGN CALCULATION SPREADSHEET

Project Name: _____ Proposed Percent Imperviousness: _____ (K)
 Project Location: _____ Proposed Runoff "C" Value: 0.25
 Maximum Allowable Outflow (CFS): 0.00 (G)
 Cont. Drainage Area (Acres): _____ (L) Storm Recurrence Interval (Yrs): 100

A	B	C	D	E	F	G	H	I	J
Duration (Minutes)	Duration (Hours)	100-Year Total Rainfall (Inches)	100-Year Rainfall Intensity (Inch/Hr)	Proposed Runoff Flowrate (CFS)	Proposed Runoff Volume (CFT)	Maximum Allowable Outflow (CFS)	Required Detention Storage (CFT)	Required Forebay Storage (CFT)	Total Required Storage (CFT)
5	0.08	0.78	9.37	0.00	0	0.00	0	0	0
10	0.17	1.14	6.86	0.00	0	0.00	0	0	0
15	0.25	1.40	5.58	0.00	0	0.00	0	0	0
20	0.33	1.63	4.89	0.00	0	0.00	0	0	0
30	0.50	1.99	3.98	0.00	0	0.00	0	0	0
40	0.67	2.19	3.29	0.00	0	0.00	0	0	0
50	0.83	2.37	2.84	0.00	0	0.00	0	0	0
60	1.00	2.72	2.72	0.00	0	0.00	0	0	0
90	1.50	2.84	1.89	0.00	0	0.00	0	0	0
120	2.00	3.46	1.73	0.00	0	0.00	0	0	0
180	3.00	3.93	1.31	0.00	0	0.00	0	0	0
360	6.00	4.56	0.76	0.00	0	0.00	0	0	0
720	12.00	4.92	0.41	0.00	0	0.00	0	0	0
1080	18.00	5.22	0.29	0.00	0	0.00	0	0	0
1440	24.00	5.40	0.23	0.00	0	0.00	0	0	0

Total Storage Detention and Retention Required Storage (CFT): 0

RETENTION POND DESIGN CALCULATION

Retain the 100-Year 24-Hour Storm event from the Entire Contributing Area

Volume = 2 x 16,500 x Contributing Drainage Acreage x Composite C value

0 CFT

- A) Duration of the storm event in minutes.
- B) Duration of the storm event in hours.
- C) Total amount of rainfall during a 100-year recurrence storm event for the given duration in Column A & B. Calculated by multiplying Column B & D.
- D) Average rainfall intensity during the 100-year recurrence storm event.
(ref.: NOAA Atlas 14 Station ID:20-2395, Holt, MI).
- E) The unrestricted 100-year recurrence discharge flowrate from the proposed site under fully developed conditions. Calculated by multiplying Intensity (D) and Drainage Area (L).
- F) The unrestricted storm event for the given duration in Column A and B. Calculated by multiplying the Proposed Runoff Flowrate (E) by the Storm Duration (A) and by 60 seconds/minute.
- G) The maximum allowable discharge from the site is determined by multiplying the drainage area by 0.20 cfs per acre or if the proposed outlet is restrictive by determining the sites share of the existing outlets capacity on a contributing area basis.
- H) The required detention storage is determined by multiplying the differention flowrate (Inflow (E) - Outflow (G), by the corresponding duration (A) and by 60 seconds/minute.
The calculated maximum release rate only occurs when the pond is full.
As the pond dewateres the actual release rate from the pond will decrease from the maximum allowed release rate to 0.
Therefore, an average release rate equal to 50% of the maximum rate is used in calculating the required storage volume.
The amount of storage required for various storm durations will vary based on rainfall intensity, the size of the drainage area, and the allowable discharge. The maximum volume of storage for the various storm durations will be the required detention storage volume. This volume of storage will be determined above the required retention volume calculated in Column I.
- I) The required retention storage is determined by multiplying the drainage area (L) by 0.5 inches of rain.
- J) Total required storage is the sum of Column H and I.
- K) Proposed percent imperviousness. This assumption will be used to determine the proposed runoff coefficient. Impervious surface will be assumed to have a value of 0.9 and pervious a value of 0.2.
- L) Contributing Drainage to the proposed detention or retention system.

Calculation By: _____
 Date: _____

SHIAWASSEE COUNTY DISCHARGE CALCULATION SPREADSHEET

Project Name: _____
Project Location: _____

Restrictors are required to regulate the discharge of storm water to the allowable discharge rate established for the site. Restrictors are typically in the form of an orifice. The outlet pipe however should be checked as a metering line to verify that its capacity is not restricting the discharge.

ORIFICE

The circular in-line restrictor is sized based on the orifice formula.

FORMULA

a = $Q_o / [0.62 (64.4(h))^{1/2}]$

a = area of orifice (sq. ft.)

Qo = Maximum Allowable Outflow (cfs)

h = head differential from center of orifice to hydraulic grade line of detention facility at maximum capacity (ft).

CALCULATION

Qo = _____ cfs

h = _____ ft.

a = $\frac{\#DIV/0!}{}$ sq. ft.

Orifice Dia. = $\frac{\#DIV/0!}{}$ ft.

Orifice Dia. = $\frac{\#DIV/0!}{}$ in.

METERING LINE

The metering line calculation is based on the manning's equation.

FORMULA

Qm = $a(1.49/N) R^{2/3} S^{1/2}$

a = area of pipe (sq. ft)

N = Manning's roughness coefficient

R = hydraulic radius = area/wetted perimeter

S = hydraulic grade line slope (ft/ft)

CALCULATION

Pipe Dia. = _____ in.

Pipe Dia. = $\frac{0}{}$ ft.

a = $\frac{0.00}{}$ sq. ft.

N = _____

R = $\frac{\#DIV/0!}{}$

S = _____ ft/ft.

Qm = $\frac{\#DIV/0!}{}$ cfs

If Qm is less than Qo discharge is limited by outlet pipe and should be re-evaluated

If Qo is less than Qm discharge is limited by orifice

Calculation By: _____
Date: _____